NUTRITIONAL OEDEMA IN A VEGETARIAN

BY

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Nutritional oedema has long been recognized as an accompaniment of gross disease of the alimentary tract and of conditions which lead to excessive loss of plasma proteins. It is commonly seen in conjunction with chronic dysentery and other conditions giving rise to chronic diarrhoea. It may be accompanied by symptoms of vitamin deficiency, such as peripheral neuritis or pellagra, and an anaemia of microcytic or macrocytic type is often associated with it.

The chief factor in the causation of nutritional oedema is generally considered to be a hypoproteinaemia, with a consequent lowering of the osmotic pressure of the blood and a disturbance of the balance of fluid distribution between the blood and the interstitial tissue spaces. Moore and van Slyke (1930) state that oedema develops when the total serum proteins fall below the critical level of 5.5 ± 0.3 g. per 100 c.cm.; but other factors, such as the intake and excretion of blood electrolytes, the blood volume, and the presence or absence of anaemia, must also influence the occurrence of oedema, so that it does not necessarily appear when the serum protein content falls below the so-called critical level.

In the absence of gross alimentary disease nutritional oedema is rare in this country, and even vegetarians are able to maintain an adequate protein intake, in spite of wartime restrictions in diet. The case to be described, however, illustrates how a vegetarian diet in association with a comparatively minor gastro-intestinal abnormality may cause a hypoproteinaemia of serious degree, giving rise to symptoms similar to the "hunger" or "famine" oedema which occurred epidemically in Europe during the last war and which will no doubt occur again during this war.

Case Report

The patient, a woman aged 61, was first seen in consultation with Dr. B. A. Abbott, of Rugeley, on Aug. 3, 1943. During the previous few weeks Dr. Abbott had treated her for a severe anaemia by ferrous sulphate and small doses of liver extract intramuscularly. Although the anaemia had practically disappeared she had developed ascites and generalized oedema during the preceding ten days. In 1932 a gastro-enterostomy had been performed for pyloric stenosis due to a chronic ulcer, but no gastric symptoms had occurred since and her health had been good until the onset of the anaemia. She stated that she was an almost complete vegetarian, the only animal foods taken being milk and cheese. For the last eight weeks her appetite had been poor and her intake of milk had been low owing to rationing.

On examination she was pale but not grossly anaemic. Her skin was dry and had a slightly atrophic appearance. She had a red glazed tongue, sore at the tip, and her finger-nails showed a well-marked koilonychia. Gross ascites and a generalized oedema of the whole trunk were present, but oedema was only slightly evident in the face. There was some dyspnoea, and signs of free fluid were observed in both sides of her chest. The pulse rate was 100 per minute, but there was no cardiac enlargement or irregularity. B.P. 140/90. The urine was normal, containing no albumin or casts. Her mental state was normal, and she showed no neurological abnormality. There was no diarrhoea, and the stools were normal in appearance.

She was admitted to hospital for further investigation on Aug. 5. A diagnosis of nutritional oedema had been considered, but the possibility of gastric carcinoma with widespread secondary deposits had to be excluded. Investigations produced the following results: Blood count: R.B.C., 3,900,000 per c.mm.; Hb, 72%; C.I., 0.92; W.B.C., 10,200 per c.mm.—polymorphs 76%, lymphocytes 21%, monocytes 3%; slight anisocytosis and poikilocytosis of red cells. Total plasma proteins: 3.3 g. %—albumin 1.98%, globulin 1.32%. Serum sodium 313 mg., serum calcium 8.1 mg., and blood pyruvic acid 0.77 mg. per 100 c.cm. Fractional test meal: complete histamine-fast achlorhydria, with emptying time of $1\frac{1}{2}$ hours. Pleural fluid: 46 lymphocytes per c.mm.; protein 240 mg., chlorides 620 mg. per 100 c.cm. An x-ray film of the chest showed large bilateral pleural effusions. Radiological examination of the stomach and intestinal tract revealed no abnormality apart from the gastro-enterostomy. During the first four days in hospital her urinary output was low, averaging about 600 c.cm. a day, without restriction of fluid intake. She continued her vegetarian diet during this time.

On Aug. 10 the patient was given two bottles of reconstituted plasma intravenously. On the 11th it was noticed that her urinary output had risen to 1,800 c.cm. during the 24 hours and her total plasma proteins to 4 g. %—albumin 2.66%, globulin 1.34%. Two more bottles of reconstituted plasma were given on the 12th, and she was persuaded, with some difficulty, to take a high-protein diet containing ample amounts of animal protein. During the next week the high urinary output was maintained and there was a rapid diminution in the ascites, generalized oedema, and pleural effusions. Her further progress was uneventful, and the ascites, oedema, and pleural effusions had disappeared completely in about ten days. Oral and intravenous glucose-tolerance tests were done on Aug. 14 and 15 respectively, and showed no disturbance of sugar metabolism. She has remained well up to the time of writing, having abandoned her vegetarian diet.

Comment

Hypoproteinaemia has been classified by Davis and Getzoff (1942) into three types: (1) *Prehepatic hypoproteinaemia*, in which there is interference with adequate intake, digestion, or absorption of plasma-protein building materials. In this type the ability of the liver to form plasma protein is not affected. (2) *Hepatic hypoproteinaemia*, in which there is inability of the liver itself to form plasma proteins, in spite of the fact that normal supplies of protein building material are received from the intestines. This type is usually associated with severe hepatic disease. (3) *Post-hepatic hypoproteinaemia*, in which there is an adequate formation of plasma proteins by the liver, but an abnormal loss of plasma protein, as in severe burns or prolonged haemorrhage or suppuration.

The case described was of the "prehepatic" type. The patient's vegetarian diet contained a minimal amount of protein, and when her appetite was poor her protein intake was further reduced. The complete achlorhydria no doubt interfered with adequate digestion, and so the plasma proteins fell below the level required to maintain the normal osmotic pressure of the blood. The achlorhydria also interfered with her iron intake and produced an iron-deficiency anaemia.

The treatment of severe degrees of nutritional oedema by a high-protein diet alone may be slow, and it seems reasonable to expect a more rapid response from intravenous plasma transfusions. This expectation was well borne out by the immediate increase in the urinary output after the first plasma transfusion and the rapid disappearance of the oedema.

REFERENCES

- Moore, N. S., and van Slyke, D. D. (1930). *J. clin. Invest.*, **8**, 337.
Davis, H. A., and Getzoff, P. L. (1942). *Arch. Surg.*, Chicago, **44**, 1071.

Medical Memoranda

The Use of Cyclopropane in the Field

Shortly before the second battle of Alamein I received, through the co-operation of the D.M.S., M.E.F., Major-General Sir Percy Tomlinson, A.M.S., and the Technical Adviser in Anaesthetics, M.E.F., Major R. W. Cope, R.A.M.C., a cylinder of cyclopropane for use in the forward areas. Since then I have had a small but adequate supply, and I have used it at a C.C.S. during the Eighth Army's advance almost to the end of the campaign, at a field surgical unit for the Sicilian campaign, and also for four months in Italy, from the landing at Salerno onwards. I think it is now possible to make some assessment of the value of cyclopropane for the type of case operated on in casualty clearing stations and field surgical units.

Approximately 1,200 cases were anaesthetized by me during this time. Pentothal alone was the drug used in 80% of the cases; cyclopropane, with or without the addition of nitrous oxide or occasionally ether, in 10%; local anaesthesia in 5%; and intravenous morphine in 5%. The cyclopropane was reserved for the penetrating wounds of the abdomen, the thoraco-abdominal wounds, and those few cases which were regarded as very bad risks and had failed to respond to resuscitative measures. It was found to be of great value in all these cases.

THE PROCEDURE

Penetrating Wounds of the Abdomen.—Most cases were already adequately morphinized, and no further premedication was given. They almost all came to the theatre with a slow blood drip going, and induction was usually effected by injecting 0.25 g. to 0.5 g. of pentothal. Intubation was done as a